INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

 25X1

S-E-C-R-E-T

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GENERAL

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1. The Leningrad Metal Plant i/n Stalin (Leningradskiy Metallicheskiy Zavod imeni Stalina) is located at 19 Palyustrovskaya (now Sverdlovskaya Naberezhnaya), Kalininskiy Rayon, in Leningrad. The Leningrad Krasnyy Vyborzhets Nonferrous Metal Plant of the Ministry of Nonferrous Metallurgy and, further along the quay, the Leningrad Machine and Electrical Equipment Plant i/n Sverdlov of the Ministry of Machine Tool Building and Tool Industry are neighboring plants. A branch line from the Finlyandskiy Freight Station on the Oktyabrskaya Railroad and a wharf on the Neva River serve the plant. The plant is controlled by the USSR Ministry of Heavy Machine Building and is directly subordinate to the Directorate of Boiler and Turbine Building.

HISTORY

2. The plant was founded as the St. Petersburg Metal Works in 1857 when its principal manufacturing consisted of boilers and various metal products for the oil and coal industries. In 1904-1905, the plant first started producing low-rated steam turbines of 110-1,250 kw; the number turned out up to the time of the Russian Revolution was about 20. Work practically came to a standstill after the Revolution, when some of the shops were shut down completely. Only individual orders for various metal products were filled. In 1923, the plant became part of the newly created Leningrad Machine Building Trust and was assigned the task of manufacturing boilers, steam trubines, and water turbines. A considerable part of the plant was evacuated in the fall of 1941 when the German advance threatened Leningrad. Repair of land and naval guns and tanks was carried out in the remaining installations. The period between the time that the siege was raised and the termination of the war was employed in rebuilding the plant and recruiting and training young personnel.

PRODUCTION PRIOR TO WORLD WAR II

Boilers

3. Steam boilers produced by the plant in 1923 were low capacity; medium-capacity steam boilers were made later. From 1931 to 1934, the plant turned out a 25X1

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considerable number of three-drum vertical tube boilers with outputs of 48-180 tons per hour and pressures of 30.5-34 atmospheres of the following types:

Item	Output tons per hr	Working Pressure Atmospheres	Steam Temperature °C	Heating Surface sq m
1.	160	34	425	2,500
2.	180	34	425	2,500
3.	90	32	425	1,600
4.	110	32	425	1,500
5. ZVG	75	30.5	400	1,250
6.	48	32	425	800
7.	48	32	425	650

4. From 1933 to 1939, the plant produced horizontal sectional water tube boilers of the Babcock-Wilcox type with longitudinal drums, as follows:

Item	Heating Surface sq m	No of Drums	Diameter of drum mm	Length mm	Sections: No of Sections	Sections: Tubes per Sections	Sections: Diameter mm	Sections: Length mm
1	102	1	915	6,325 (less superheater	6	9	102/94	4,875
2	150	1	-	-	-	-	-	-
3	204	2	915	6,325	12	9	102/94	4,875
4	250	2	915	6,955	12	10	102/94	5,485
5	301	2	1,067	6,955	16	9	102/94	5,485
6	400	2	1,229	7,035	18	11	102/94	5,485
7	515	2	1,219	7,155	18	14	102/94	5,485

5. From 1933 to 1941, the plant also turned out marine sectional boilers, without economizers, of the following types:

Item	Heating Surface sq m	Drum Diameter mm	Drum Length mm	No of Sections	Tubes: No of Tubes per Forward Section	Tubes: No of Tubes per Rear Section	Length of Tubes in mm
1	300	1,370	3,708	20	10	12	4,213
2	750	1,370	9,486	50	10	12	4,213
3	1,000	1,370	9,486	50	12	14	4,350
4	450	1,200	4,750	26	10	12	4,500
5	1,400	1,370	9,042	50	12	14	--

6. Between 1938 and 1941, the plant likewise built single-drum, high-output boilers of the following types:

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Type	Steam Output tons per hr	Steam Pressure Back of Superheater atm abs	Temp of Superheated Steam °C	Heating Surface in Square Meters: Radiation	Boiler Nest of Tubes	Superheater	Economizer	Air Preheater	Drum: Diam mm	Length mm	Steam Dome: Diam mm	Length mm	Boiler: Width mm	Depth	Height	Total Weight Inc Air Preheater in tons
KO-III using anthracite dust	200	315	425	430	500	1,170	825	8,200	1,582/ 1,486	/11,340	954/ 894	7,200	10,980	14,110	32,775	530
KO-IV using shale or peat	200	315	425	256	720	1,040	1,100	7,800	1,582/ 1,486	/11,340	954/ 894	6,900	14,940	15,775	25,220	-
KO-VI using coal dust from Moscow Coal Basin	200	315	425	564	170	1,215	1,470	8,768	1,582/ 1,486	/11,340	954/ 894	7,700	10,200	15,450	33,000	-
KO-VII War-time project subsequently taken on by Krasnyy Kotelshchik Boiler Plant at Podolsk (N 55-23, E37-30) which produced	240	100	500													
TO-230-1	230	100	510													
TsKKB-LMZ 200 horizontal water tube boiler with round sectional header	200	31.5 (34 atm in drum)	425	380	570	1,380	1,040	9,920	1,384/ 1,294	/11,000	958/ 894	7,200	11,500	15,530	32,300	

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Steam Turbines

7. In 1923, the plant turned out its first steam turbine since the end of the Revolution. These were all low-rated 2,000 kw turbines. In 1924, the Design Office of the plant designed a 10,000 kw steam turbine which was built in 1925. In 1928, the plant turned out 22 steam turbines with an aggregate capacity of 67,000 kw and, in 1929, 30 steam turbines with an aggregate capacity of 105,000 kw were turned out. In 1930, the plant switched over to the manufacture of large-capacity steam turbines after turning small-turbine construction over to the Electrical Equipment Plant i/n Kirov in Leningrad. In 1931, series manufacture of 24,000 and 50,000 kw steam turbines was undertaken, while in 1934 the 100,000 kw AK-100-1 turbine was produced. The plant turned out 15 different types of steam turbines up to World War II. The specifications of these turbines were:

Type	Maximum Rating kw	Speed rpm	Pressure Working atm abs	Pressure Final atm abs	Steam Temperature °C	Remarks
OK-30 (later AK-3.5)	3,500	3,000	16	0.04	350	The letter "A" denotes steam characteristic of 29-35 atm abs and temperature of 435°.
TN-165 (later /1938/ the AK-24-1) twin-pressure turbine. The high-pressure chamber comprised 20 stages and the low-pressure chamber five stages. Production ceased in 1939 when manufacture of the AK-25-2 began.	24,000	3,000	26	0.04	375	The letter "T" denotes a turbine with regulative bleeding.
DK-184 (later the AK-25-2) twin-pressure turbine with high-pressure chamber of 20 stages and low pressure chambers of five stages. Steam consumption at a load of 25,000 kw: 4.88 kg per kw hr	25,000	3,000	29	--	400	The letter "K" denotes a condensation turbine without regulative bleeding.
TN-250 (later the AK-50-1) high pressure chamber of 24 stages, low pressure chamber of 16 stages.	50,000	1,500	29	0.04	400	Production ceased in 1940, replaced by production of the AK-50-2.

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AK-50-2 with single chamber. Weight: 161 tons (1/3 of weight of AK-50-1) Length: 24.5 m Height: 7m	50,000	3,000	29	--	400	Improvements over AK-50-1 type include reduction of rotor from 32.5 to 15.5 tons, of number of blades from 12,716 to 1,888, and number of stages from 40 to 12. This turbine was subsequently replaced in 1946 by the VK-50-1 high-pressure turbine.
P-165 (later known as the APR-12-1)	12,000	3,000	29	1.2	400	Steam bleeding at six atm abs. Letter "R" denotes a back-pressure turbine. Letter "P" denotes a turbine with regulative bleeding (5-13 atm abs)
DKO-185 (later the AT-25-1)	25,000	3,000	29	0.04	400	Steam bleeding at 1.2 atm abs
DKO-185-2 (later the AT-25-2)	Identical with the DKO-185 turbine apart from design of front bearing and other small modifications.					
DKO-195 (later the AP-25-1) The high-pressure chamber has a Curtis disc and seven stages, and the low pressure chamber a Curtis disc and six stages	25,000	3,000	29	0.04	400	Steam bleeding at seven atm abs (up to 170 tons an hour)
OP-175 (later the APR-12-1)	12,000	3,000	29	--	400	Steam bleeding at 11 atm abs, back pressure: 1.2 atm abs
MK-65 (later the MK-6-1)	6,000	3,000	1.2 dry saturated steam	0.1	--	Letter "M" denotes steam characteristic of 1-2.5 atm abs with saturated or slightly superheated steam
MK-66 (later the MK-6-2)	6,000	3,000	1.8 dry saturated steam	--	--	----------
F-135 (later the VR-25-1)	25,000	3,000	125	--	450	Back pressure: 37 atm abs

DK-405 (later the AK-100-1) condensation turbine	100,000	3,000	29	0.04	400	The high-pressure part has eight stages. Steam bleeding at four points for preheating feed water with pressures on full load of 0.3, 1.5, 4.1, and 8.2 atm abs. Temperature of feed water on full load: 160°C approximately.

Production of the above turbine types ceased in 1947, when the plan began building high-pressure, high-steam temperature turbines of the VK-100 type. The figures following the letters in the type of designation in parentheses denote the nominal rating of the turbine in thousands of kw. The serial number of the design follows the second dash.

8. Special steam turbines produced by the plant before World War II included marine turbo sets comprising turbine, condenser, and gearing. These turbines were of various types, e.g., compound turbines with high-pressure and low-pressure chambers of 16,000 kw and 17,500 kw ratings and compound turbines with high, medium, and low-pressure chambers of 40,000 kw and 55,000 hp rating. The steam pressure of these turbines varied from 26 to 36 atm abs, the steam temperature being about 385 degrees C.

Water Turbines

9. In 1924, the Leningrad Metal Plant began manufacturing water turbines, the first of which was a small-capacity unit of 55 kw, with a head of 7.5 m, and a speed of 600 rpm. This turbine was subsequently installed in the Akhaltsikhe (N 41-38, E 42-59) Hydroelectric Power Station in the Georgian SSR. The second water turbine to be built in 1924 was a horizontal, radial-flow turbine with a rating of 370 kw, a head of 14 m, and a speed of 214 rpm. The plant produced 14 water turbines in 1928 with an aggregate capacity of 11,000 kw, a figure which was increased to 16,000 kw in 1929 when 19 water turbines were turned out. From 1930, the plant began to specialize in the construction of high-capacity water turbines, the manufacture of small and medium-capacity units being turned over at that time to the Moscow Plant i/n Kalinin (sic) which, however, ceased production of water turbines some years later. Large-capacity water turbines produced by the Leningrad Metal Plant in the 1930s included a 13,000 kw unit for the Rion (N 42-08, E 41-39) Hydroelectric Power Station in the Georgian SSR, built in 1933, and a 7,700 kw unit for the Gizel'-Donskaya (N 43-11, E 44-25) Hydroelectric Power Station in North Osetian ASSR, built in 1934. During the same decade, 24,000 kw water turbines were built for hydroelectric power stations at Dzorages [at Kalagiran (N 40-55, E 44-34)] in the Armenian SSR, on the Niva River at Kandalaksha (N 67-09, E 32-26) in Murmansk Oblast, and for the Lower Svir Hydroelectric Power Station. In 1937, the plant produced water turbines with fully automatic control for the Ivankovo in Kalinin Oblast, Skhodnya (N 55-57, E 37-19) in Moscow Oblast, and for the Karamyshevo (N 57-45, E 28-42) Hydroelectric Power Stations in Pskov Oblast on the Moscow Canal, with capacities of up to 17,000 kw, while, in 1940 and 1941, large water turbines were made for the Uglich (N 57-32, E 38-20) and Shcherbakov (N 58-03, E 38-50) Hydroelectric Power Stations in Yaroslavl Oblast. The water turbine installed at the Shcherbakov station is a Kaplan turbine of 70,000 kw capacity, with a head of 12-20 m, speed of 62.5 rpm, rate of flow of 500 cu m of water per second, diameter of rotor wheel 9 m, weight of wheel 300 t, and total weight of turbine 1,315 t. Each of the four stainless steel vanes weighs about 20 t. The diameter of the main shaft, which weighs 48 t, is 1,300 mm, and of the shaft flanges, 1,980 mm.

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10. Between 1924 and 1941, the plant turned out 18 different types of water turbines in various sizes as shown below:

Type	Remarks
PrK 70-VO: No longer built after 1930	The letters "PrK" denote that this water turbine was a propeller type, developed from the Kaplan turbine with fixed vanes. The letter "V" denotes vertical shaft and the letter "O" open chamber. The figures denote the type of rotor.
PrK 245-VB: No longer built after 1930	The letter "B" denotes concrete spiral T-section chamber.
PrK 129-VB: No longer built after 1930	
K 70 VB	The letter "K" denotes Kaplan turbine.
K 245-VB	The letter "K" denotes Kaplan turbine.
K 90-VB	The letter "K" denotes Kaplan turbine.
K 129-VB	The letter "K" denotes Kaplan turbine.
F 300-GF	The letter "F" denotes Francis turbine; the letter "G" horizontal shaft, and the second "F", frontal chamber.
F 123-VB	
F 100-VM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 82-GM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 82-VM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 60 VM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 13-GM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 15-GM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 15-VM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 13-VM	The letter "M" denotes metal spiral chamber, with circular cross-section.
F 128-VM	The letter "M" denotes metal spiral chamber, with circular cross-section.

PRODUCTION AFTER WORLD WAR II

11. It was not until 1946 that the plant stopped making boilers and started to manufacture high-capacity steam turbines for power stations and sea-going ships. The Leningrad Metal Plant i/n Stalin shared this assignment with the Kharkov Turbogenerator Plant i/n Kirov. The Kharkov Plant manufactures its own generators,

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whereas the Leningrad Metal Plant obtains its generators from the Leningrad Elektrosila Electrical Equipment Plant. The manufacture of low and medium-capacity turbines was entrusted to the Electrical Equipment Plant i/n Kirov and the Nevskiy Machine Building Plant i/n Lenin in Leningrad, the Ural Turbine Plant at Sverdlovsk, the Kaluga Turbine Plant, Kaunas Turbine Plant, and the Bryansk Krasnyy Profintern Locomotive Plant[1]. That same year the Central Boiler and Turbine Institute (TsKTI), aided by specialists from the Leningrad Metal Plant, issued specifications for types and sizes with steam characteristics of 90 atm abs and 480-500 degrees C for large turbines, and 35 atm abs and 435 degrees for medium turbines. The State Standards Committee (GOST) approved these in 1947 and made them obligatory for all turbine construction. In designing the new high-capacity turbines, the Leningrad Metal Plant and the Kharkov Turbogenerator Plant also standardized 75 percent of the parts used in the manufacture of 25,000 kw and 100,000 kw turbines and continued to produce standard turbine parts of other ratings. Uninterrupted contact is maintained between the Leningrad and the Kharkov plants. In 1954, for instance, engineers of the former plant were employed for some time at the Kharkov plant in assembling and machining parts for 100,000 kw steam turbines, as well as for building water turbines for the Kakhovka (N 46-49, E 33-30) Hydroelectric Power Station in Kherson Oblast. Their engineers also worked in 1954 as instructors at the Syzran (N 53-11, E 48-27) Water Turbine Plant in Kuybyshev Oblast where they advised the local technicians on the machining and assembly of water turbines for the Kama Hydroelectric Power Station in Molotov Oblast.

12. Steam turbines manufactured since 1946 include:

Type	Maximum Continuous Rating kw	Speed rpm	Steam Pressure atm abs	Steam Temperature °C	Remarks
VK-50-1 high-pressure, single-cylinder, condensation turbine	50,000	3,000	90	480	Steam consumption at load of 50,000 kw, 198 t/hr; at 20,000 kw, 78 t/hr. Turbine is equipped with one regulating stage (Curtis disc) and 17 pressure stages. Total weight 150 t. The turbine is fitted with two safety regulators, electro-magnetic relay, and relay for automatic starting of emergency oil pump, and overload relay. Oil pressure in control system has been increased to 12 atm. Average diameter of rotor is 2,000 mm. The blade of the final stage is 665 m long. The leading edges of the blades of the 17th and 18th stages are protected from wear by satellite cover plates.
VK-100-2 high-pressure, twin-cylinder, condensation turbine	100,000	3,000	90	480	First built in 1946, this turbine has one regulating stage (Curtis disc) and 17 pressure stages. The last five stages are located in the low-pressure cylinder and are in duplicate. Steam consumption at 100,000 kw is 396 t/hr and at 70,000 kw, 265 t/hr. Critical speed of high-pressure rotor (fixed): 3,620 rpm. Critical speed of low pressure rotor (flexible): 1,670 rpm. Weight of turbine: 270 t. Weight of high-pressure rotor: 10.3 t. Length of forged seamless rotor: 4,896 mm. Weight of low-pressure rotor: 22 t.

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VT-25-3 single-cylinder, high-pressure turbine	---	---	--	---	Only six turbines of this type were produced before being replaced by the slightly modified VT-25-4.
VT-25-4 single-cylinder, high-pressure turbine	25,000	3,000	90	500	Regulative steam bleeding for heating purposes up to 100 t/hr at 1.2-2.5 atm abs with regulating stages (Curtis disc) and 15 stages in high-pressure part and five stages in low-pressure part.
VPT-25-3 single-cylinder, high-pressure turbine	25,000	3,000	90	480	Two bleeding points (industrial: 72 t/hr, heating: 54 t/hr) at pressures of 10 and 2.5 atm abs respectively and three points for bleeding steam for regenerative preheating of water.
VR-25-1 single-cylinder, high-pressure turbine	25,000	3,000	125 (live steam) 34 (back pressure)	450	One regulating stage (Curtis disc) and eight pressure stages.
SVK-150-1 three-cylinder, single-shaft, ultra-high pressure turbine	150,000	3,000	170 (live steam)	550	Length of turbine is 22 m. The turbine is coupled to a hydrogen-cooled generator built by the Leningrad Electrosila Electrical Equipment Plant. Letter "S" was introduced in 1952 to denote ultra-high pressure.

Condensers for Steam Turbines

13. Double-flow condensers made by the Leningrad Metal Plant for medium-pressure steam turbines of 25,000 kw include the following:

Condenser Type	Characteristics.	Turbine Type
24-K-1 24-K-2 24-K-3 24-K-4 24-K-5 24-K-6	These two-flow condensers vary in cooling surface as well as in the number, diameter, and length of tubes. Thus, the 24-K-1 has a cooling surface of 1,900 sq m, 4,600 tubes of 22/24 mm diameter, and 5,564 mm length. Weight of condenser less water is 75 t. The 24-K-6 condenser has a cooling surface of 1,590 sq m and 5,690 tubes of 17/19 mm diameter, and 4,470 mm length, with condenser weighing 53 t, less water.	AK-24-1
25-K-1 25-K-2 25-K-3 25-K-4 25-K-5 25-K-6 25-K-7 25-K-8 25-K-9 25-K-10	Two-flow condenser 25-K-10 has a cooling surface of 1,950 sq m, 4,300 tubes of 22/24 mm diameter, and 6,080 mm length. Weight less water is 44.6 t.	AT-25-1 AP-25-1 AK-25-2

14. Double-flow condensers for medium-pressure turbines of 50,000 kw include the following:

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Condenser Type	Characteristics	Turbine Type
50-K-1 to 50-K-8	Two-flow condenser 50-K-1 has a cooling surface of 3,120 sq m, 6,200 tubes of 23/25 mm diameter, and 6,470 mm length. Weight less water is 140 t; the two-flow condenser 50-K-8 has a cooling surface of 3,400 sq m, 6,200 tubes of 23/25 mm diameter, and 7,090 mm length. Weight less water is 66 t.	AK-50-1 AP-50-1 AK-50-2

15. Condensers produced by the Leningrad Metal Plant for high-pressure steam turbines include the following:

Condenser Type	Characteristics	Turbine Type
25-KTsS-4	Cooling surface is 2,000 sq m, 4,420 tubes of 22/24 mm diameter, and 6,000 mm length.	VT-25-4
Two-flow 25-KTsS-5	Cooling surface is 1,750 sq m, 3,880 tubes of 22/24 mm diameter, and 6,060 mm length. Weight is 31.7 t.	VPT-25-3
Two-flow 50-KTsS-1	Cooling surface is 3,400 sq m, 6,200 tubes of 23/25 mm diameter, and 7,00 mm length. Weight is 63 t. Wall thickness of condenser is 12 mm, length of condenser is 8,550 mm. Width of upper part of condenser is 2,550 mm. Height of condenser is 4,500 mm.	VK-50-1
50-KTsS-2	Cooling surface is 3,000 sq m, 5,450 tubes of 23/25 mm diameter, and 7,000 m length.	VK-50-1
Two-single-flow 100-KTsS-1	Cooling surface is 2 x 2,800 sq m, 2 x 6,350 tubes of 17/19 mm diameter, and 7,400 mm length.	VK-100-2

16. Single-flow condensers for medium-pressure AK-100-1 type turbines of 100,000 kw capacity are of the 100-K-1 type, two being used for each turbine. Characteristics of this type are: Cooling surface 2 x 600 sq m and 2 x 8,150 tubes of 17/19 mm diameter and 7,490 mm length. Weight of condenser, less water, is 2 x 80 t.

17. Condenser tubes are of L 68 brass when fresh water is used and MN-70-30 German silver (Melchior) alloy for standardized sea water use. Condenser water drums for fresh water are made of welded steel, while cast iron is used for condensers using sea water. The condensers are fitted with automatic atmospheric valves or automatic diaphragm valves.

Circulating Pumps

18. Circulating pumps produced by the Leningrad Metal Plant before World War II were of the L-32 type, which had a delivery rate up to 700 cu m per hour, a water column pressure of 35-20 m, a speed of 485 rpm, and motor ratings of 750-420 kw for use with AK-25-2 (DK-184), AP-25-3 (DKO-195), AK-50-1, and other steam turbines. At the present time, the plant is producing the centrifugal TsE-1.3-1200 pump for VK-100-2 turbines, which have a delivery rate of 11,000 cu m per hour, a water column pressure of 13 m and a speed of 415 rpm; and axial pumps for marine condenser plants. The axial pumps are of the Ts-1200 type, which have a delivery rate of 15,000 cu m per hour, a water-column pressure of 13 m, a speed of 485 rpm, and a rating of 750 kw. The rotor wheel has six pivoting vanes, measures 1,075 mm (sic), and weighs 14 t. The electric motor weighs nine t. Circulating pumps for VT-25-1, VK-50-1, and VK-100-2 type high-pressure steam turbines are made by the Moscow Pump Plant i/n Kalinin and are respectively of the 24 NDN, 32-D-10, and 48-D-22 types.

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Condensate Pumps

19. Pumps for the removal of condensate from condensers, made by the Leningrad Metal Plant, are of the following types:

Type	Output (cu m/hr)	Water Column Pressure (m)	Speed (rpm)	Rating of Motor (kw)	Water Temp °C	Remarks
KD-150	150 (max)	44	1,450	45	90	For MK-6-1 (MK-65) and AP-25-1 (DKO-195) turbines: Two pumps per turbine.
KD-151	-	-	-	-	-	For AK-25-2 (DK-184), AT-25-1 (DKO-195), and AK-25-1 (TN-165) turbines.
KD-152	140	60	1,450	65	90	For AT-25-2 and VT-25-4 turbines: Two pumps per turbine.
KD-153	140	60	1,450	65	90	For VTP-25-3 and AP-25-2 turbines: Two pumps per turbine.
KD-201	250 (max)	50	1,450	80	125°(max)	For VK-50-1 turbines.
KD-200	240 (max)	56	1,450	89	90°(max)	For AK-50-1 (TN-250) turbines: Two pumps per turbine.
KD-2-200	250	75	1,450	125	35°(max)	For AK-100-1 (DK-405) turbines: Three pumps per turbine.
KE-4-5-50	175	50	1,450	-	-	For VK-100-2 turbines: Three pumps per turbine.
ZV-200	500 (max)	116(max)	1,450	175	-	For AK-50-1 and VK-50-1 turbines.

Ejectors

20. Prior to World War II, the Leningrad Metal Plant produced LeBlanc-type air pumps and water jet pumps (hydraulic ejectors), but now the plant manufactures only steam ejectors of the following types:

Type	Volume of Air Sucked per Hr (kgs)	Steam Consumption per Hr (kgs)	Absolute Mercury Column Pressure (mm)	Remarks
25-E-1	20	250	30	For AK-25-2 turbines, in the use of two ejectors, the steam consumption rises to 2 x 250 kg/hr, the volume of air sucked per hr to 60 kg, and the absolute mercury column pressure to 160 mm, using two P-2 starting ejectors.

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E-2N with two stages	44	2 x 400	30	For AK-50-1 turbine, use is made of two P-2 starting ejectors.
100-E-1	120	--	20	For AK-100-1 turbines, use is made of two EP-1 starting ejectors.
EP-3-600-2	--	--	--	For VK-100-2 and VK-50-1 turbines, use is made of two EP-3-600-2 three-stage ejectors and two EP-1-600-2 starting ejectors.

Feed Pumps for Steam Boilers

21. Feed pumps for steam boilers built by the Leningrad Metal Plant include the following:

Type	Output (cu/m/hr)	Pressure	Speed (rpm)	Water Temp (C)	Remarks
P-8-150 multi-stage sectional	230	700 m	2,950	100-110	For feeding steam boilers.
P150-150 high-pressure	270	140 atm	2,970	100-110	

Miscellaneous Equipment

22. Other equipment designed and manufactured by the Leningrad Metal Plant i/n Stalin are: Shaft-turning mechanism for restarting turbine shafts after stoppage, centrifugal regulators, safety switches, oil servomotors, oil TNOM-100-type turbo-pumps, oil coolers, steam and oil relays, relays for automatic starting of emergency oil pumps, centrifugal cracking pumps made of steel alloy and built for pressures of 700-1,000 m with outputs of 300 cu m/hr, and special orders for important engineering works, such as Uralmashzavod at Sverdlovsk, and the Electrical Equipment Plant i/n Kirov in Leningrad.

Water Turbines

23. The Leningrad Metal Plant continued to produce a few late-design, medium-capacity turbines after the war. In 1945, the plant received an order for the manufacture of six out of the nine Francis turbines required in the rebuilding of the Dnepr Hydroelectric Station, which the Germans had destroyed. [redacted] on representations made by N. Kovalev, Chief of the Water Turbine Design Office of the Leningrad Metal Plant, six of the turbines were built by the Leningrad plant [redacted] The first of the turbines was completed in mid-1947 and the sixth in October 1949. Each of these F-123-VM-545 radial-flow Francis turbines had a capacity of 75,000 kw, 102,000 hp for a head of 36 m, speed of 83.25 rpm, efficiency coefficient of approximately 0.93, diameter of rotor wheel 5.45 m, diameter of rotor wheel (external) 6 m, height of rotor wheel 3.4 m, weight of rotor wheel 89.5 t, welded metal spiral chamber of 20 m diameter, weight 160 t and a stator of cast carbon steel.

24. During the First Five-Year Plan, water turbines were built for many hydroelectric power stations. These included 27,000 kw turbines for the Upper and Lower Svir River Hydroelectric Power Stations, 18,000 kw units for the Kegums (N 56-44, E 24-43) station located 46 km from Riga, and other units at Farkhad near Begovat (N 40-14, E 69-14) in Uzbek SSR, Sukhumi (N 43-00, E 41-02) in the Georgian SSR, Dzaudzhikau (N 43-00, E 44-40) in North Osetian ASSR, and the Khram (N 41-36, E 44-05) Hydroelectric Power Station in the Georgian SSR. Power stations in which water turbines made by the Leningrad Metal Plant have been installed during the Second Five-Year Plan included those at Tsimlyanskaya (N 47-38, E 42-06) on the

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Volga-Don Canal in Kamensk Oblast, Gorkiy, Kakhovka, Angara (N 56-05, E 101-48) in Irkutsk Oblast, Stalingrad, and Kuybyshev. Most of the water turbines to be installed in the Kakhovka Hydroelectric Power Station will be supplied by the Kharkov Turbogenerator Plant. Each of the four turbines supplied by the Leningrad Metal Plant for the Tsimlyanskaya Hydroelectric Power Station has a rating of 40,000 kw and six-vane pivoting rotor wheels; the diameter of the wheels is 6.6 m.

Regulating Equipment

25. The Leningrad Metal Plant produces the T-25, T-50, T-100, L-200, L-400, L-750, L-1200, L-1800, and L-2500 type governor. The figures denote the fly-wheel effort in kg/m. The main elements of these governors are centrifugal pendulum, slide valve, and servomotor. Other governors include the S-1, S-2, and S-3 types with vertical or horizontal pendulum shafts and pumps. The plant also turns out the K-75, K-100, K-125, K-150, K-200, K-250, and K-350 control pillars; the figures denote the diameter of the pressure pipe conduit in mm.

OUTPUT

26. Only one 100,000 steam turbine was built by the plant when it began to specialize in 1946. In addition, a considerable quantity of parts for new turbines was manufactured. It was not until 1950 that large steam turbines were turned out in quantity; 13 with an aggregate capacity of approximately 700,000 kw were built that year. This figure was increased to 1,050,000 kw in 1954 when 17 large steam turbines were built for power stations and ships. The plant built eight large water turbines, and five medium-capacity water turbines, with an aggregate capacity of 1,200,000 kw, in 1954. Seven of the large turbines were for the Kuybyshev Hydroelectric Power Plant.

27. The quantity of products which have to be scrapped has been greatly reduced as compared with those scrapped from 1946 to 1948.

PERSONNEL

28. The chief executives of the plant are:

Name	Status	Remarks
V. I. Vasiliyev	Director	replaced Kozharinov in 1951
M. N. Bushuyev	Chief Engineer	Stalin Prizewinner
A. G. Kulagin	Deputy Chief Engineer	
N. N. Kovalev	Chief Designer in Water Turbine Department	Stalin Prizewinner (twice)
S. A. Granovskiy	Deputy Chief Designer, Water Turbine Department	Stalin Prizewinner
M. I. Grinberg	Chief Designer in Steam Turbine Department	Professor, Stalin Prizewinner
K. A. Spiridonov	Deputy Chief Designer, Steam Turbine Department	Stalin Prizewinner
G. A. Drobilko	Chief Technologist	
K. P. Petropavlovskiy	Chief Metallurgist	
S. I. Surkov	Chief Power Supply Engineer	

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A. G. Antonov	Head of Technical Control Department	
A. A. Lomakin	Head of Cracking Pumps Department	Stalin Prizewinner

29. Approximately 15,000 persons worked at the plant in 1954.[2] The plant now has experienced engineers, technicians, and foremen, and many special schools are run for the training of young workers and technicians.

EQUIPMENT

30. Though the equipment installed since the war is satisfactory, the plant does not have the forge, press, or foundry equipment for manufacturing ultra-large forgings and castings for heavy machinery and especially for large water turbines. This equipment is obtained from the Novokramatorsk Heavy Machinery Plant i/n Stalin at Kramatorsk (N 48-43, E 37-33) in Stalino Oblast, the Nevskiy Machine-Building Plant i/n Lenin and the Electrical Equipment Plant i/n Kirov in Leningrad, the Novokramatorsk Machine Plant at Elektrostal, and the Uralmashzavod at Sverdlovsk. Since the Leningrad Metal Plant specialized in machining and assembling large machinery, it is equipped with large machine tools, which include lathes for turning pieces 2.5 m in diameter and 20 m between centers, vertical turning and boring machines with 19 m and 14-m-diameter face plates, radial drilling machines for holes of up to 80 mm, horizontal boring and milling machines, portal-type milling machines, ultra-large planing machines which plane up to five or six m width with table movement up to 20 m, and duplicating milling machines made by the Gorkiy Milling Machine Plant [3] and by foreign firms. The machining and assembly shops are also extensively equipped with hoisting and conveying equipment of all kinds. Repair work on the plant is done very slowly, so that many of the buildings now require urgent repairs.

31. The plant shops and departments include:

First, Second, Third, Fourth, and Fifth Machine Shops

Foundry (heavy castings)

Foundry (medium castings)

Foundry (precision castings)

Pattern Shops No. 1 and No. 2

Forge shop

Steam turbine department

Blade shop for steam turbines

Machine assembly shops

Welding Shops No. 1 and No. 2

Water turbine department

Pump shop

Condenser shop

Cracking pump department

Metal construction shop

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Tool shop

Turbine casings shop

Standards department

Electrical department

Machine repair shop

Building repair shop

Transport department

Heat and power department

General laboratory

Water turbine laboratory

Steam turbine laboratory

Pump laboratory

CUSTOMERS

32. Customers for steam turbines include not only State electric power stations in the USSR, but also China, Rumania, and Bulgaria. Since the war, turbines of the following capacities have been supplied to various Soviet power plants:

Capacity of Turbine in kw	Power Station
100,000	Stalinogorsk
50,000	Moscow
100,000	Chelyabinsk
50,000	Shterovka[4]
50,000	Dubrovka[5]
25,000	Krivoy Rog

Turbines have also been supplied to the Minsk and Zuyevo State Rayon Power Stations and to Novosibirsk and Omsk Thermal Electric Power Stations.[6]

RESEARCH

33. The Steam Turbine Design Office is under the direction of the well-known scientist Professor Grinberg, who is assisted by a large number of experienced technologists. This office works in close collaboration with various scientific institutes and concerns itself not only with practical problems connected with steam turbine construction, but also with carrying on scientific research. The work of the office has included in the past the development of marine turbines with high steam parameters and at present is engaged on problems connected with the use of gas turbines in ships.

34. The Leningrad Metal Plant has its own hydro-experimental station located on the Skhodnya River in the Khimki Rayon of Moscow Oblast. In 1954, engineer Gushchin (fnu) was head of this station, which conducts tests on new water turbines, rotor wheels, and suction pipes. In 1953, the station carried out

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scientific research on suction pipes and rotor wheel chambers with pivoting vanes in collaboration with the All-Union Scientific Research Institute of Hydro-Machine-Building (VIGM). As a result of this research work, the design of rotor wheel chambers in all newly-built hydroelectric stations at Kuybyshev, Stalingrad, Kakhovka, Angara, and others was modified. In 1954, the experimental station also conducted research on the cavitation properties of water turbines. The first rotor wheel built for the Kuybyshev Hydroelectric Power Station was subjected to intensive tests at the Skhodnya Experimental Station before the serial manufacture of these wheels was begun.

35. There is also a special water turbine laboratory at the plant itself where research on all problems of water turbine construction is carried out. The work of this laboratory includes the construction of scale models of hydro-electric plants, e.g., a one-twentieth scale model of the Kuybyshev station, and models of high-pressure hydroelectric power stations built in the Caucasus. The plant has testing installations and stands for testing water turbines.

Comments

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1. Bryansk also has a turbine plant.

2. This is the highest labor force reported for the Leningrad Metal Plant i/n Stalin. According to other available information, the plant has labor forces of 2,000, 3,000, 6,000 to 8,000, and even 35,000. The predominant figure was 2,000 to 3,000.

3. There are no machine or machine-building plants on record in Gorkiy.

4. This is probably the Shter Regional Electric Power Station at Krasnyy Luch (N 48-08, E 38-56) in Voroshilovgrad Oblast.

5. Dubrovka (N 56-47, E 33-09) in Leningrad Oblast, RSFSR, is the only city by that name on record having a large electric power plant.

6. This is probably the Zuyevka Regional Electric Power Station in Stalino Oblast (N 48-04, E 38-15).

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